Europäisches Patentamt
European Patent Office
Office européen des brevets

(19) (11) Publication number: 0 067 595 A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: 82302768.5

(22) Date of filing: 28.05.82

(51) Int. Cl.³: A 23 G 3/30
A 23 L 1/236

(30) Priority: 02.06.81 US 269081

(43) Date of publication of application:
22.12.82 Bulletin 82/51

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI LU NL SE

(71) Applicant: WARNER-LAMBERT COMPANY
201 Tabor Road
Morris Plains New Jersey 07950(US)

(72) Inventor: Cea, Theresa
1425 27th Street
Brooklyn New York 11210(US)

(72) Inventor: Posta, Joseph Della
1105 Jenso Avenue
Mamaroneck New York 10543(US)

(72) Inventor: Glass, Michael
156-11 Aquilar Avenue
Flushing New York 11367(US)

(74) Representative: Jones, Michael Raymond et al,
Haseltine Lake & Co. 28 Southampton Buildings
Chancery Lane
London WC2A 1AT(GB)

(54) **Encapsulated L-aspartyl-L-phenylalanine methyl ester, its use in chewing gum compositions, and the production of the encapsulated ester and of chewing gum compositions incorporating the encapsulated ester.**

(57) The sweetening agent, L-aspartyl-L-phenylalanine methyl ester, in the form of particles is encapsulated by a coating material selected from cellulose, cellulose derivatives, starches, carbohydrates, gums, polyolefins, polyesters, waxes, vinyl polymers, gelatin, zein and mixtures thereof, wherein the ratio of the coating material to the methyl ester is 1:1 or less than 1:1. The encapsulated sweetening agent has less tendency to lose its sweetening characteristics when incorporated in a chewing gum or in a food product. The production of the encapsulated sweetening agent is also disclosed.

EP 0 067 595 A2

ENCAPSULATED L-ASPARTYL-L-PHENYLALANINE METHYL ESTER, ITS USE IN CHEWING GUM COMPOSITIONS, AND THE PRODUCTION OF THE ENCAPSULATED ESTER AND OF CHEWING GUM COMPOSITIONS INCORPORATING THE ENCAPSULATED ESTER

This invention relates to L-aspartyl-L-phenylalanine methyl ester, which is an artificial sweetener, in a form suitable for incorporation in food products, such as chewing gums and candies, such that it exhibits improved shelf stability in such food products. The present invention also provides processes for producing the methyl ester in encapsulated form, and for incorporating the encapsulated methyl ester in food products.

The compound L-aspartyl-L-phenylalanine methyl ester is a sweetening agent, is known as APM, and is described in United States Patent No. 3,492, 131, the disclosure of which is incorporated herein by reference. Since its development, APM has been widely recognized as a desirable artificial sweetener having particular utility for incorporation in chewing gum as disclosed in United States Patent No. 3,943,258.

Several problems have been observed with APM, among them that it breaks down in contact with water, and in contact with certain flavours such as cinnamon. Also, APM tends to break down from exposure to elevated temperatures In the instance where APM is incorporated in chewing gums the relatively high temperatures of storage and shipment of the product and contact of the gum with water, tend

to cause the APM to break down, and lessens sweetness. In partiuclar, high temperatures have been found to induce the ester linkage to hydrolyze to the dipeptide aspartylphenylalanine which in turn cyclizes to the corresponding diketopiperazine, in which last form sweetness is substantially lessened. Several methods of preparing the APM for incorporation into chewing gums have been proposed that attempt to alleviate this problem by rendering the APM more stable. For example, United States Patents Nos. 4,122,195 and 4,139,639, propose to fix APM by preparing it with a material such as gum arabic or the reaction product of a compound containing a polyvalent metallic ion, with an ungelatinized starch acid-ester of a substituted dicarboxylic acid, by a spray drying technique, where the APM and the film former are prepared in an emulsion.

While the foregoing technique is reported to show some improvement in shelf stability, relatively rapid breakdown of APM still occurs. Also, the relatively large amount of APM being stabilized, results in reduced intensity of sweetness release, a high intensity being a particularly important attribute of a commercially successful chewing gum.

It is therefore desirable to formulate APM in a manner which increases the shelf stability of APM in products to which APM is added.

In accordance with one aspect of the present invention, there are provided particles of L-aspartyl-L-phenylalanine methyl ester encapsulated by a coating material selected from cellulose, cellulose derivatives, starches, carbohydrates, gums, polyolefins, polyesters, waxes, vinyl polymers, gelatin, zein, and mixtures thereof, wherein the ratio by weight of the coating material to said methyl ester is 1:1 or less than 1:1.

The coating materials may be either water-soluble or water-insoluble, and are preferably utilized in an amount with respect to the APM in the weight ratio of

1:1 to 1:10, and preferably in the ratio range of 1:1 to 1:5.

Another aspect of the present invention provides a process for producing a product containing L-aspartyl-L-phenylalanine methyl ester and having good shelf stability when incorporated in food products, the process comprising forming particles of said methyl ester, and encapsulating the particles in a coating material selected from cellulose, cellulose derivatives, starches, carbohydrates, gums, polyolefins, polyesters, waxes, vinyl polymers, gelatin, zein and mixtures thereof, wherein the ratio of the coating material to the methyl ester is 1:1 or less than 1:1.

Thus the present invention relates to a process for extending the shelf stability of a food product containing L-aspartyl-L-phenylalanine methyl ester (APM), by forming particles of APM, and encapsulating the particles in one or more of the coating materials set forth above, so that the ratio of the coating material to the particulate APM does not exceed 1:1. More particularly, the process includes encapsulating the APM particles with the coating materials while the APM particles are in solid form, and at temperatures lying below the decomposition of the APM particles. The temperatures may range up to 200°F (93°C), and preferably lie in the range from 100 to 125°F (46 to 60°C).

In a preferred embodiment, the aforementioned process of the present invention is performed by conducting the APM particles in a stream of air that passes through a zone of atomized liquid droplets of the coating material, so that the coating material is deposited on the surface of the APM particles. Preferably, the process of the present invention is performed under substantially anhydrous conditions.

The encapsulated APM may be utilized in a variety of food products where sweetness is desirable.

Moreover, in accordance with a further aspect of the present invention, there is provided a chewing gum composition comprising a gum base, a flavour, a bulking agent, and a sweetener comprising L-aspartyl-L-phenylalanine methyl ester, the sweetener being in the form of particles encapsulated with a coating material selected from cellulose, cellulose derivatives, starch, carbohydrates, gums, polyolefins, polyesters, waxes, vinyl polymers, gelatin, zein, and mixtures thereof, wherein the ratio by weight of the coating material to the methyl ester is 1:1 or less than 1:1.

The present invention also provides a process for extending the shelf stability of a chewing gum composition which is to contain, as sweetener, L-aspartyl-L-phenylalanine methyl ester, the process comprising forming particles of said methyl ester; encapsulating the particles in a coating material selected from cellulose, cellulose derivatives starches, carbohydrates, gums, polyolefins, polyesters, waxes, vinyl polymers, gelatin, zein and mixtures thereof, wherein the ratio of the coating material to the methyl ester is 1:1 or less than 1:1; and incorporating the encapsulated particles in the chewing gum composition.

The APM may be encapsulated alone, or may first be combined with a sugar or other sugar substitute, such as sorbitol. The APM may be encapsulated with more than one coating material, and the coating materials may be applied in more than one layer. In one embodiment, a plurality of layers of different coating materials are sequentially applied.

The encapsulated APM prepared in accordance with the present invention has been found to exhibit shelf stability when it is incorporated in food products, that substantially exceeds the stability obtained with APM processed in accordance with the prior art. In addition, this stability is gained with a concurrent reduction in the amount of coating material required, so that the

sweetness release of APM in a food product may be controlled.

The APM prepared in accordance with the present invention comprises particles of APM encapsulated with a coating material that is inert with respect to the APM, and is nontoxic and therefore acceptable for consumption. The coating materials or encapsulants utilized in the present invention include cellulose, cellulose derivatives, starches, carbohydrates, gums, polyolefins, polyesters, waxes, vinyl polymers, gelatin, zein, and mixtures thereof. The foreging materials include both water-soluble and water-insoluble coating, that may all be used successfully.

More particularly, the coating materials useful in the present invention include cellulose, cellulose derivatives such as cellulose ethers and cellulose esters, including methyl cellulose, ethyl cellulose, cellulose nitrate, cellulose acetate phthalate, carboxymethylcellulose, and hydroxyethyl cellulose. Carbohydrates may include arabinogalactan, and others; polyolefins include polyethylene; and vinyl polymers include polymethacrylates, polyamides, ethylene-vinylacetate copolymers, and polyvinylpyrrolidone.

Suitable gums may include gum arabic, while waxes may include paraffin, carnauba wax, spermaceti, and beeswax. Certain lipids may also be acceptable, such as stearic acid, stearyl alcohol and glyceryl stearate.

Preferably, the coating materials used in the present invention are selected from ethyl cellulose, hydroxypropyl cellulose, gelatin, polyvinylpyrrolidone, zein and mixtures thereof. The present invention is not limited to the use of these materials, however, and contemplates the inclusion of all of the materials set forth above.

Though the ratio of the quantity of the coating materials or encapsulating agents to the APM may vary, it is possible successfully to coat and stabilize the APM with no more than an equal quantity of each. Ratios of coating material to APM preferably range from 1:1

to 1:10 and more preferably range from 1:1 to 1:5.

APM particles may be encapsulated by more than one layer of the coating materials, in accordance with the coating process described hereinafter. In a further embodiment, the APM particles may be coated by plural diverse coating materials, disposed either in admixture with each other or in discrete layers. In the latter instance, for example, the APM may be initially coated with a water-soluble resin,

after which a water-insoluble resin may be disposed thereover. The advantage of this latter sequence, is to extend the protection of the APM from premature exposure to water, and resultant breakdown.

The present method of preparing APM comprises encapsulating the APM with the coating materials and within the parameters set forth above. APM may be encapsulated by a variety of coating techniques, including spray drying, coascervation, and the like. Preferably, the APM is encapsulated by a method that operates in similar fashion to fluidized bed coating processes, in that particles of APM are suspended in an apparatus that creates a strong upward air current or stream in which the particles move. The stream passes through a zone of finely atomized droplets of the coating material or encapsulant, after which the thus coated particles pass out of the upward stream and pass downward in a fluidized condition countercurrent to a flow of heated fluidized gas whereupon they are dried, and may reenter the upward-moving coating zone for a subsequent discrete coating application. The foregoing method and associated apparatus are known as the Wurster Process. The Wurster Process and its associated apparatus are set forth in detail in the following U.S. Patents, disclosures of which are incorporated herein by reference: U.S. Patent No. 3,089,824; U.S. Patent No. 3,117,027; U.S. Patent No. 3,196,827; U.S. Patent No. 3,241,520; and U.S. Patent No. 3,253,944.

One of the advantages of the present method is that it may be conducted at temperatures that are reduced from those utilized in prior art encapsulation processes. In particular, the present process may operate at inlet temperatures in the order of 100 to 125°F, so that relatively mild heating of the APM takes place while the coating material is disposed thereon. The temperature may vary

up to the decomposition point of APM, and for example, may range as high as 200°F. The selection of a particular temperature within the aforementioned range is therefore contemplated within the scope of the present invention.

The coating material is prepared for use in the present encapsulation method by the formation of a liquid capable of being uniformly atomized. In particular, solutions, dispersion or emulsion of the coating materials in respective solvents may be prepared, depending upon the nature of the coating material. For example, water-soluble coating materials may be prepared as aqueous solutions, while those water-insoluble resins or coating materials are prepared with appropriate organic solvents such as acetone, lower alcohols such as isopropyl alcohol, and the like.

In a preferred embodiment, encapsulated APM may be prepared under substantially anhydrous conditions, as the water present in the prior art particle forming processes promotes the undesired hydrolytic breakdown. By "substantially anhydrous" in accordance with the present invention, it is meant that the APM is encapsulated while in solid form, as distingushed from the disposition of APM in an emulsion that takes place when APM is combined with a coating material by the spray drying technique.

In addition, the encapsulant itself may be chosen from those water-insoluble coating materials, whereby the corresponding coating solution is non-aqueous. The invention also includes, however, the preparation and use of water-soluble coating materials disposed in aqueous solutions.

In some instances, it may be desirable to add other ingredients such as plasticizers, to improve the properties of the ultimate coating. Suitable plasticizers include

the glyceryl ester of sebacic acid, diethyl phthalate, glyceryl triacetate, tributyl citrate, acetylated monoglyceride, citric acid ester of monodiglyceride, adipate ester, and others. The plasticizers may be added in known effective amounts within the scope of the invention. Such other known materials acceptable for ingestion, may also be utilized herein.

The coating materials are projected through an appropriately sized nozzle to form an atomized cloud of coating material particles. The coating materials may be projected at a rate of flow ranging from about 100 up to about 500 ml/minute and the particles of APM may receive their first coating within 3 to 10 seconds. The entire process may naturally vary depending upon the extent of coating desired, and can range from 10 minutes to 2 hours. Naturally, the foregoing parameters are for purposes of illustration only, and may vary depending upon the nature of the coating material, the nozzle utilized in the coating apparatus and the desired extent of encapsulation.

As noted earlier, the ratio of encapsulating agent or coating material to APM may vary from about 1:1 to about 1:10 or better.

Even encapsulated APM particles having the minimum coating in accordance with the present invention exhibit the improved shelf stability over encapsulated APM prepared in accordance with the prior art.

The encapsulated APM particles may be prepared in a variety of sizes, and it may be desirable to reduce the size of the particles for use in chewing gum formulations. The particles may accordingly be reduced in size to, for example,

from about 60 to about 20 mesh size by conventional means, such as grinding, without deleteriously affecting the stability of the resulting APM particles.

The APM may be prepared in encapsulated form alone, or may be combined with other sugars or sugar substitutes as later defined, such as sorbitol, by the formation of a mixture of the two materials. Sorbitol is a known sugar substitute which may be utilized in conjunction with other such agents either alone or in a mixture with APM. In the instance where a co-melt of sorbitol and APM is formed, the melt is solidified and the resulting composite particle may, if necessary, be reduced in size and encapsulated in accordance with the method set forth above. APM, as noted earlier, may replace sugar or sucrose in a variety of foods, such as breakfast cereals, dairy product analog toppings, candy, and chewing gums.

In the instance where APM is to be incorporated in a chewing gum, the gum base may be any chewable, substantially water-insoluble base such as chicle or substitutes thereof, guttagkay, sorva, jelutong, synthetic resins, rubbers and the like and mixtures of these materials. The amount of gum base employed in the chewing gum may vary depending upon the particular base utilized and the other ingredients that make up the final product. Generally, however, the gum base may vary in amount from about 15 to 40% by weight of the final composition, and preferably from about 20 to about 30% by weight.

Plasticizers or softeners such as lanolin, propylene glycol, glycerol and the like and mixtures of these may optionally be incorpoated within the gum base to achieve desired texture and consistency. The flavors employed

in chewing gums may be the essential oils or synthetic flavors or mixtures of these. Flavors such as cinnamon, wintergreen, spearmint, peppermint, birch, anise, fruit flavors and the like may be utilized satisfactorily. The amount of flavoring is a matter of preference, but may be subject to such factors as the type of flavor and the type of base utilized in conjunction therewith. Generally, flavoring materials account for about 1% by weight of the total gum composition.

As it is generally desirable that the chewing gum possess a distinct and favorable sweetness, the remaining portion of the chewing gum is generally composed of a sweetener such as sugar or, in the instance of sugarless gums, a sugar substitute. By sugar, is meant sucrose, dextrose, corn syrup, solids and substitutes thereof, and mixtures thereof. Sugar substitutes may include any sweetening agents utilized in sugarless gum such as mannitol, sorbitol, xylitol, saccharin, cyclamate, and dipeptides such as APM, dihydrochalcone, glycyrrhizin, and Stevia rebaudiana (Stevioside). Also contemplated as an additional sweetener is the non-fermentable sugar substitute (hydrogenated starch hydrolysate) which is described in U.S. Reissue Patent 26,959, and the synthetic sweetener 3,4-dihydro-6-methyl-1,2,3-oxathiazin-4-one-2,2-dioxide particularly the potassium, sodium and calcium salts thereof as described in German Patent No. 2,001,017.7.

Sugar and sugar alcohols may also be included and defined as bulking agents, and generally comprise a major amount by weight of the total composition. Additionally, non-sweet bulking agents such as hydrolyzed cereal solids may be included as well.

In the instance where the encapsulated APM of the present invention is to be incorporated in a chewing gum, it may be utilized in an amount ranging from about 0.02 to about 0.25%, and will offer satisfactory sweetness. Naturally, the exact amount of encapsulated APM incorporated in a given chewing gum may vary depending, as indicated earlier, upon the remaining ingredients thereof, and the invention is not limited to a specific range of proportions.

The present invention will be better understood from a consideration of the following illustrative examples, wherein all percentages expressed are intended to be percent by weight unless otherwise specified.

EXAMPLE I

Comparative testing of chewing gums incorporating encapsulating APM were conducted. Two formulations containing, respectively, APM encapsulated in Gum Arabic and APM encapsulated in Capsul© Dextrin were prepared in accordance with the procedure outlined in U.S. Patent No. 4,139,639, in Example II. The relevant disclosure of the '639 patent is incorporated herein by reference.

Comparative chewing gum formulations were prepared in the same manner as disclosed in the patent, with the exception that the APM utilized in each formulation was prepared in accordance with the present invention. Particularly, APM particles were encapsulated with the following coating materials, by the Wurster Process, to form particles having a size ranging from about 20 to about 60 mesh; the coating materials comprised ethyl cellulose, hydroxypropyl cellulose and polyvinyl pyrrolidone. Encapsulated APM particles were

incorporated into chewing gum formulations, and shelf stability calculated in terms of percentage loss of APM was observed and noted over a time period ranging up to 18 weeks. The tests involving the formulations of the '639 patent varied by the use of the flavor peppermint, while those of the present invention utilized the flavor spearmint.

The results of these tests are set forth in Table I, below.

TABLE I

EFFECT OF ENCAPSULATION ON APM STABILITY

SAMPLE #	DESCRIPTION	% APM LOSS AT 100°F			% APM LOSS AT 37°C (approx. 98.6°F)		
		4wks	9wks	20wks	4wks	9wks	20wks
*1	APM Fixed in Gum Arabic	17	22	43			
*2	APM Fixed in Capsul®	21	32	54			
3	APM Encapsulated with Ethyl Cellulose				40	28	22
4	APM Encapsulated with Hydroxypropyl Cellulose				12	37	29
5	APM Encapsulated with Polyvinyl Pyrrolidone				18	12	21

*Corresponds to Samples 5 and 6 of U.S. Patent 4,139,639.

From the above, it is apparent that the chewing gum formulations utilizing the encapsulated APM of the present invention lost approximately 50% less APM over a comparable period than did the formulations employing the APM stabilized in accordance with the prior art.

EXAMPLE II

A series of chewing gum formulations were prepared in the same manner as those prepared in Example I. A series of APM encapsulations were made, and the encapsulated particles were then combined with the remaining chewing gum ingredients in identical quantities with respect to each other. The samples were divided up so that samples of each preparation were subjected to observation at room temperature and at 37°C.. Observation was conducted over a period of 38 weeks, and the results of these tests are set forth in Table II, below. The differing characteristics of each preparation are set forth in the Table.

TABLE II

APM LOSS DURING STORAGE

SAMPLE NO.	DESCRIPTION		THEORETICAL	INITIAL	APM LEVEL (ppm) 2wks	4wks	8wks	12wks	18wks	20wks	30wks
1	Sugarless Spearmint Gum - no film on APM	RT	500	--	180	210	150			180	
		37°C			110	130	110			180	
2	Spearming Gum - APM in hydroxypropyl cellulose, 40 mesh	RT	500	--	570	400	510			575	
		37°C			430	480	435			145	
3	Spearmint Gum - APM in ethyl cellulose, 40 mesh	RT	1000	810		810	1000	1185	935		505
		37°C				605	730	720	785		
4	Spearmint Gum - APM in hydroxypropyl cellulose, 40 mesh	RT	1000	1040		820	870	795	770		390
		37°C				880	1000	630	710		
5	Spearmint Gum - APM in polyvinyl pyrrolidone, 40 mesh	RT	1000	1015		990	1180	825	450+		1008
		37°C				820	750	880	790		

TABLE II (cont.)

APH LOSS DURING STORAGE

SAMPLE NO.	DESCRIPTION		THEORETICAL	APH LEVEL (ppm) INITIAL	2wks	4wks	8wks	12wks	18wks	20wks	38wks
6	Spearmint Gum - APH in ethyl cellulose - hydroxypropyl cellulose mixture (60/40), 40 mesh	RT	1000	1030		710	730	425	450		240
		37°C				475	-	780	410		
7	Spearmint Gum - APH in gelatin, 40 mesh	RT	1000	780		955	880	1060	830		615
		37°C				1050	900	815	520		
8	Cinnamon Gum- APH in hydroxypropyl cellulose, 40 mesh	RT	1000	900			860	865			630
		37°C					555	360			
9	Cinnamon Gum - APH in ethyl cellulose - hydroxypropyl cellulose mixture (60/40), 40 mesh	RT	1000	700			975	595			590
		37°C					515	385			

TABLE II (cont.)

APM LOSS DURING STORAGE

SAMPLE NO.	DESCRIPTION		THEORETICAL	APM LEVEL (ppm) INITIAL	2wks	4wks	8wks	12wks	18wks	20wks	38wks
10	Cinnamon Gum - APM in gelatin, 40 mesh	RT	1000	805			825	600			540
		37°C					505	650			
11	Cinnamon Gum - APM in ethyl cellulose, 40 mesh	RT	1000	1100	985	920	715			590	785
		37°C			575	720	615				
12	Cinnamon Gum - APM in polyvinyl pyrrolidone, 40 mesh	RT	1000	755			630	825	450		750
		37°C					395				

This invention may be embodied in other forms or carried out in other ways without departing from the spirit or essential characteristics thereof. The present invention is therefore to be considered as in all respects illustrative and not restrictive, the scope of the invention being indicated by the appended claims, and all changes which come within the meaning and range of equivalency are intended to be embraced therein.

CLAIMS (for all designated States including Austria):

1. Particles of L-aspartyl-L-phenylalanine methyl ester encapsulated by a coating material selected from cellulose, cellulose derivatives, starches, carbohydrates, gums, polyolefins, polyesters, waxes, vinyl polymers, gelatin, zein and mixtures thereof, wherein the ratio by weight of the coating material to the methyl ester is 1:1 or less than 1:1.

2. A chewing gum composition comprising a gum base, a flavour, a bulking agent, and a sweetener comprising L-aspartyl-L-phenylalanine methyl ester, the sweetener being in the form of particles encapsulated with a coating material selected from cellulose, cellulose derivatives, starch, carbohydrates, gums, polyolefins, polyesters, waxes, vinyl polymers, gelatin, zein, and mixtures thereof, wherein the ratio by weight of the coating material to the methyl ester is 1:1 or less than 1:1.

3. A process for producing a product containing L-aspartyl-L-phenylalanine methyl ester and having good shelf stability when incorporated in food products, the process comprising forming particles of said methyl ester, and encapsulating the particles in a coating material selected from cellulose, cellulose derivatives, starches, carbohydrates, gums, polyolefins, polyesters, waxes, vinyl polymers, gelatin, zein and mixtures thereof, wherein the ratio of the coating material to the methyl ester is 1:1 or less than 1:1.

4. A process for extending the shelf stability of a chewing gum composition which is to contain, as sweetener, L-aspartyl-L-phenylalanine methyl ester, the process comprising: forming particles of said methyl ester; encapsulating the particles in a coating material selected from cellulose, cellulose derivatives, starches, carbohydrates, gums, polyolefins, polyesters, waxes, vinyl polymers, gelatin, zein and mixtures thereof, wherein the ratio of the coating material to the methyl ester is 1:1 or less than 1:1; and incorporating the

encapsulated particles in the chewing gum composition.

5. An invention according to any one of Claims 1 to 4, wherein the coating material is selected from cellulose, methyl cellulose, ethyl cellulose, cellulose nitrate, cellulose acetate phthalate, carboxymethyl cellulose, hydroxyethyl cellulose, arabinogalactan, polyethylene, polymethacrylates, polyamides, ethylene-vinyl acetate copolymers, polyvinylpyrrolidone, gum arabic, paraffin wax, carnauba wax, spermaceti, beeswax, stearic acid, stearyl alcohol, glyceryl stearate, gelatin, zein and mixtures thereof.

6. An invention according to any one of Claims 1 to 5, wherein the particles are encapsulated by the deposition therein of atomized droplets of at least one layer of the coating material.

7. An invention according to Claim 6, wherein the deposition is conducted at a temperature of up to 200°F (93°C).

8. An invention according to Claim 6 or 7, wherein plural layers of the coating material are deposited upon the particles.

9. An invention according to any one of Claims 6, 7 or 8, wherein a plurality of coating materials are mixed with each other prior to deposition upon the particles.

10. An invention according to any one of Claims 6, 7 or 8, wherein a plurality of coating materials are deposited separately and sequentially upon the particles.

11. An invention according to any one of Claims 1 to 10, wherein the methyl ester is combined with at least one optional sweetener selected from sugar, sugar substitutes, and mixtures thereof, prior to encapsulation by the coating material.

12. An invention according to any one of Claims 1 to 11, wherein the particles are encapsulated under substantially anhydrous conditions.

CLAIMS (for Austria alone):

1. A process for producing a product containing L-aspartyl-L-phenylalanine methyl ester and having good shelf stability when incorporated in food products, the process comprising forming particles of said methyl ester, and encapsulating the particles in a coating material selected from cellulose, cellulose derivatives, starches, carbohydrates, gums, polyolefins, polyesters, waxes, vinyl polymers, gelatin, zein and mixtures thereof, wherein the ratio of the coating material to the methyl ester is 1:1 or less than 1:1.

2. A process for extending the shelf stability of a chewing gum composition which is to contain, as sweetener, L-aspartyl-L-phenylalanine methyl ester, the process comprising: forming particles of said methyl ester; encapsulating the particles in a coating material selected from cellulose, cellulose derivatives, starches, carbohydrates, gums, polyolefins, polyesters, waxes, vinyl polymers, gelatin, zein and mixtures thereof, wherein the ratio of the coating material to the methyl ester is 1:1 or less than 1:1; and incoprorating the encapsulated particles in the chewing gum composition.

3. A process according to Claim 1 or 2, wherein the coating material is selected from cellulose, methyl cellulose, ethyl cellulose, cellulose nitrate, cellulose acetate phthalate, carboxymethyl cellulose, hydroxyethyl cellulose, arabinogalactan, polyethylene, polymethacrylates, polyamides, ethylene-vinyl acetate copolymers, polyvinyl-pyrrolidone, gum arabic, paraffin wax, carnauba wax, spermaceti, beeswax, stearic acid, stearyl alcohol, glyceryl stearate, gelatin, zein and mixtures thereof.

4. A process according to Claim 1, 2 or 3, wherein the particles are encapsulated by the deposition thereon of atomized droplets of at least one layer of the coating material.

5. A process according to Claim 4, wherein the deposition is conducted at a temperature of up to 200°F (93°C).

6. A process according to Claim 4 or 5, wherein plural layers of the coating material are deposited upon the particles.

7. A process according to any one of Claims 4, 5 or 6, wherein a plurality of coating materials are mixed with each other prior to deposition upon the particles.

8. A process according to any one of Claims 4, 5 or 6, wherein a plurality of coating materials are deposited separately and sequentially upon the particles.

9. A process according to any preceding claim, wherein the methyl ester is combined with at least one optional sweetener selected from sugar, sugar substitutes, and mixtures thereof, prior to encapsulation by the coating material.

10. A process according to any preceding claim, wherein the particles are encapsulated under substantially anhydrous conditions.